

## FLIGHT SUMMARY REPORT

**Flight Number:** 99-136  
**Calendar/Julian Date:** 26 September 1999 • 269  
**Sensor Package:** Wild Heerbrugg RC-10  
Airborne Visible and Infrared Imaging  
Spectrometer (AVIRIS)  
Thematic Mapper Simulator (TMS)  
**Area(s) Covered:** Arizona

**Investigator(s):** King, USGS

**Aircraft #:** 806

### SENSOR DATA

<b>Accession #:</b>	05401	----	----
<b>Sensor ID #:</b>	034	099	074
<b>Sensor Type:</b>	RC-10	AVIRIS	TMS
<b>Focal Length:</b>	12" 304.66 mm	----	----
<b>Film Type:</b>	Aerochrome IR SO-134	----	----
<b>Filtration:</b>	Wratten 12	----	----
<b>Spectral Band:</b>	510-900nm	----	----
<b>f Stop:</b>	11	----	----
<b>Shutter Speed:</b>	1/275	----	----
<b># of Frames:</b>	164	----	----
<b>% Overlap:</b>	60	----	----
<b>Quality:</b>	Excellent	----	Good
<b>Remarks:</b>	Add 12 seconds for correct UTC		

## Airborne Science Program

The Airborne Science Program at NASA's Dryden Flight Research Center, Edwards, California, operates two ER-2 high altitude aircraft in support of NASA earth science research. The ER-2s are used as readily deployable high altitude sensor platforms to collect remote sensing and in situ data on earth resources, celestial phenomena, atmospheric dynamics, and oceanic processes. Additionally, these aircraft are used for electronic sensor research and development and satellite investigative support.

The ER-2s are flown from various deployment sites in support of scientific research sponsored by NASA and other federal, state, university, and industry investigators. Data are collected from deployment sites in Kansas, Texas, Virginia, Florida, and Alaska. Cooperative international scientific projects have deployed the aircraft to sites in Great Britain, Australia, Chile, and Norway.

Photographic and digital imaging sensors are flown aboard the ER-2s in support of research objectives defined by the sponsoring investigators. High resolution mapping cameras and digital multispectral imaging sensors are utilized in a variety of configurations in the ER-2s' four pressurized experiment compartments. The following provides a description of the digital multispectral sensor(s) and camera(s) used for data collection during this flight.

## Airborne Visible and Infrared Imaging Spectrometer

The Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) is the second in the series of imaging spectrometer instruments developed at the Jet Propulsion Laboratory (JPL) for earth remote sensing. This instrument uses scanning optics and four spectrometers to image a 614-pixel swath simultaneously in 224 contiguous spectral bands (0.4-2.4  $\mu\text{m}$ ).

AVIRIS parameters are as follows:

IFOV:	1 mrad
Ground Resolution:	66 feet (20 meters) at 65,000 feet
Total Scan Angle:	30 <sup>o</sup>
Swath Width:	5.7 nmi (10.6 km) at 65,000 feet
Spectral Coverage:	0.41-2.45 $\mu\text{m}$
Pixels/Scan Line:	614
Number of Spectral Bands:	224
Digitization:	10-bits
Data Rate:	17 MBPS

<u>Spectrometer</u>	<u>Wavelength Range</u>	<u>Number of Bands</u>	<u>Sampling Interval</u>
1	0.41 - 0.70 $\mu\text{m}$	31	9.4 nm
2	0.68 - 1.27 $\mu\text{m}$	63	9.4 nm
3	1.25 - 1.86 $\mu\text{m}$	63	9.7 nm
4	1.84 - 2.45 $\mu\text{m}$	63	9.7 nm

All AVIRIS data is decommutated and archived at JPL and not currently available for public distribution. For further information contact Rob Green at Jet Propulsion Laboratory, 4800 Oak Grove Drive, Mail Stop 183-501, Pasadena, California 91109-8099.

## Camera Systems

Various camera systems and films are used for photographic data collection. Film types include high definition color infrared, natural color, and black and white emulsions. Available photographic systems are as follows:

- Wild-Heerbrugg RC-10 metric mapping camera
  - 9 x 9 inch film format
  - 6 inch focal length lens provides area coverage of 16 x 16 nautical miles from 65,000 feet
  - 12 inch focal length lens provides area coverage of 8 x 8 nautical miles from 65,000 feet
- Hycon HR-732 large scale mapping camera
  - 9 x 18 inch film format
  - 24 inch focal length lens provides area coverage of 4 x 8 nautical miles from 65,000 feet
- IRIS II Panoramic camera
  - 4.5 x 34.7 inch film format
  - 24 inch focal length lens
  - 90 degree field of view provides area coverage of 2 x 21.4 nautical miles from 65,000 feet

## Thematic Mapper Simulator

The Daedalus Thematic Mapper Simulator (TMS) is a multispectral scanner flown aboard the ER-2 aircraft which simulates spatial and spectral characteristics of the seven Landsat-D Thematic Mapper bands. The specific bands are as follows:

<u>Daedalus Channel</u>	<u>TM Band</u>	<u>Wavelength, <math>\mu\text{m}</math></u>
1	A	0.42 - 0.45
2	1	0.45 - 0.52
3	2	0.52 - 0.60
4	B	0.60 - 0.62
5	3	0.63 - 0.69
6	C	0.69 - 0.75
7	4	0.76 - 0.90
8	D	0.91 - 1.05
9	5	1.55 - 1.75
10	7	2.08 - 2.35
11	6	8.5 - 14.0 low gain
12	6	8.5 - 14.0 high gain

Sensor/aircraft parameters are as follows:

I FOV:	1.25 mrad
Ground Resolution:	81 feet (25 meters) at 65,000 feet
Total Scan Angle:	43°
Swath Width:	8.4 nmi (15.6 km) at 65,000 feet
Pixels/Scan Line:	716
Scan Rate:	12.5 scans/second
Ground Speed:	400 kts (206 m/second)

### **Data Availability**

The U.S. Geological Survey's EROS Data Center at Sioux Falls, South Dakota serves as the archive and product distribution facility for Airborne Science Program aircraft acquired photographic and digital imagery. The photographic archive consists of photography acquired by the program from 1971 to April 1996. For information regarding photography and digital data (including areas of coverage, products, and product costs) contact EROS Data Center, Customer Services, Sioux Falls, South Dakota 57198 (Telephone: 605.594.6151).

As of April 1996 the EROS Data Center no longer receives an archive copy of newly acquired Airborne Science Program photography. Original photography is archived with the Airborne Sensor Facility at Ames Research Center. A user copy of the photography is provided to the principal investigators for each flight. Principal investigators are cited on the first page of their respective flight summary reports. For information regarding photography acquired from April 1996 to the present contact the Airborne Sensor Facility as follows:

### **Flight Documentation and Data Archive Searches**

The following is the web site for flight documentation as published by the Airborne Sensor Facility at NASA Ames Research Center: <http://asapdata.arc.nasa.gov/er-2fsr.html>

Additional information regarding flight documentation to include data archive searches, data availability, sensor parameters, and areas of coverage may be obtained from the following: Airborne Sensor Facility, MS 240-6, NASA Ames Research Center, Moffett Field, CA 94035-1000, Telephone: 650.604.6252 (FAX 650.604.4987).

**CAMERA FLIGHT LINE DATA**  
**FLIGHT NO. 99-136**

Accession # 05401

Sensor # 034

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Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
D - E	3289-3304	17:02:37	17:09:25	66500/20269	Clear
F - G	3305-3312	17:13:40	17:16:19	65500/19964	Clear
I - J	3313-3330	17:23:41	17:30:50	65500/19964	Clear
K - L	3331-3346	17:36:18	17:42:53	65500/19964	Clear
M - G	3347-3354	17:49:20	17:52:05	65000/19812	Clear
F - N	3355-3371	17:58:50	18:05:50	65000/19812	Clear
O - P	3372-3379	18:11:31	18:14:44	65000/19812	Clear
R - S	3380-3387	18:24:55	18:27:45	65500/19964	Clear
U - V	3388-3398	18:34:55	18:39:07	65500/19964	Clear
Y - Z	3399-3410	18:49:11	18:53:51	65500/19964	Clear
P - X	3411-3419	18:57:55	19:00:53	65500/19964	Clear

**CAMERA FLIGHT LINE DATA**  
**FLIGHT NO. 99-136**

Accession # 05401

Sensor # 034

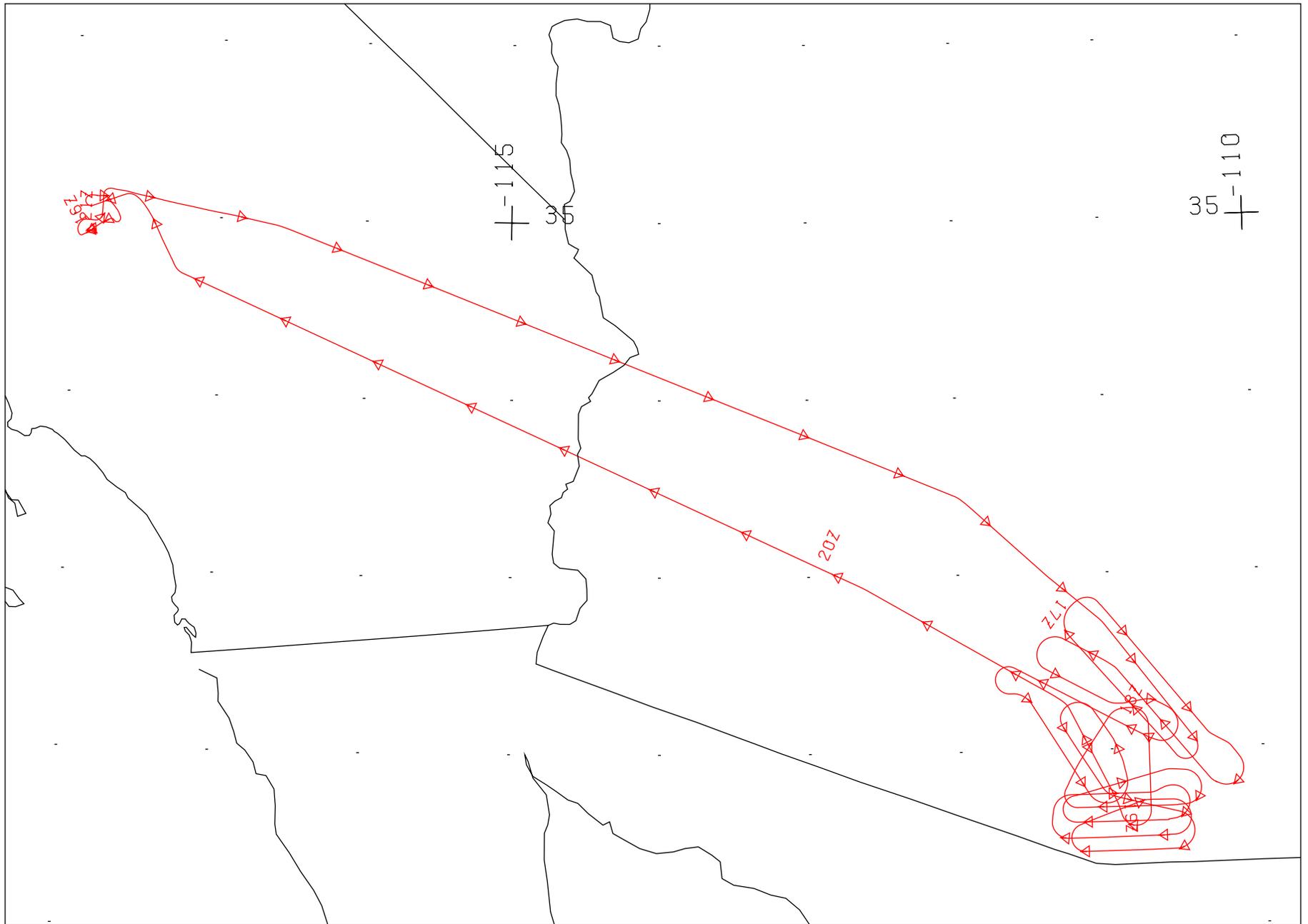
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Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
1 - W	3420-3429	19:05:29	19:09:37	65500/19964	Clear
T - P	3430-3442	19:20:24	19:25:14	65500/19964	Clear
S - 3	3443-3452	19:33:55	19:37:39	65500/19964	Clear

DAEDALUS FLIGHT DATA  
 FLIGHT NUMBER: 99-136

Check Points	Actual time (GMT)		Actual scanline		Altitude feet/meter	ground speed knots/mps	Scan Speed (rps)	total Good scanlines	total Interpolated scanlines	total Repeated scanlines
	begin	end	begin	end						
A-B	16:18:16.0	16:52:43.0	21853	47683	63783/19441	424/213	12.50	25801	0	30
B-C	16:53:39.0	16:58:43.0	48383	52183	66141/20160	421/211	12.50	3801	0	0
C-D	16:59:03.0	17:02:07.0	52433	54733	66247/20192	420/211	12.50	2301	0	0
D-E	17:02:35.0	17:09:47.0	55083	60488	66326/20216	416/209	12.50	5376	0	30
F-H	17:12:29.0	17:19:33.0	62512	67812	65599/19995	426/214	12.50	5301	0	0
I-J	17:23:05.0	17:31:08.0	70457	76502	65566/19985	415/208	12.50	5926	0	120
K-L	17:36:28.0	17:43:10.0	80492	85522	65291/19901	425/213	12.50	5001	0	30
L-H	17:44:28.0	17:46:19.0	86492	87887	65482/19959	417/209	12.50	1396	0	0
M-G	17:49:20.0	17:52:26.0	90147	92472	65136/19853	425/213	12.50	2326	0	0
F-N	17:58:52.0	18:06:10.0	97292	102767	65184/19868	412/207	12.50	5476	0	0
O-P	18:10:09.0	18:15:11.0	105756	109536	65194/19871	421/211	12.50	3751	0	30
Q	18:20:37.0	18:21:47.0	113602	114477	65544/19978	419/210	12.50	876	0	0
R-S	18:24:45.0	18:28:05.0	116712	119212	65610/19998	418/210	12.50	2501	0	0
S-T	18:28:59.0	18:32:06.0	119887	122217	65688/20022	426/214	12.50	2301	0	30
U-V	18:35:21.0	18:39:26.0	124651	127722	65532/19974	414/208	12.50	3072	0	0
W-X	18:41:48.0	18:44:32.0	129497	131547	65126/19850	428/215	12.50	2051	0	0
Y-Z	18:49:09.0	18:54:12.0	135012	138797	65395/19932	414/208	12.50	3726	0	60
P-X	18:57:52.0	19:01:10.0	141547	144022	65361/19922	426/214	12.50	2476	0	0
1-W	19:05:47.0	19:09:53.0	147476	150562	65497/19963	411/206	12.50	3027	0	60
P-F	19:12:20.0	19:16:31.0	152388	155537	65392/19931	430/216	12.50	3150	0	0
T-P	19:20:33.0	19:25:35.0	158562	162337	65545/19978	409/205	12.50	3776	0	0
2-Q	19:28:40.0	19:31:04.0	164642	166442	65578/19988	425/213	12.50	1801	0	0
F-X	19:34:01.0	19:37:55.0	168657	171577	65632/20005	418/210	12.50	2801	0	120
S-3	19:41:00.0	19:45:54.0	173897	177572	65686/20021	416/209	12.50	3676	0	0
3-4	19:47:12.0	19:57:32.0	178547	186292	65649/20010	424/213	12.50	7626	0	120
4-5	19:58:06.0	20:34:49.0	186712	214254	64730/19730	423/212	12.50	25701	1	1841

Channel 8 geographically offset 1 sample from other channels



FLIGHT 99-136

26 SEPTEMBER 1999

A/C 806

RC-10 / AVIRIS / TMS



